THE AMERICAN
JOURNAL OF PHARMACY

JULY, 1911

VOLUMETRIC DETERMINATION OF MERCURY.

By Carl E. Smith.
Laboratory of the Powers-Weightman-Rosengarten Co., Philadelphia.

Abstracts of a Report by a Committee of the Division of Pharmaceutical Chemistry of the American Chemical Society have appeared in recent journals (see this Journal, 1911, v. 83, p. 186), the work reported on being a comparison of various methods for the determination of mercury in the medicinal compounds of this metal.

The purpose of these notes is to relate some recent experiences with two of these methods, which are probably the simplest and most reliable of those mentioned in the report, the Hempel method for mercurous and the Rupp method for mercuric compounds. It is desired also to call attention to one other, which is perhaps the best volumetric method available for some purposes.

The writer's experience with the Hempel method, in its application to calomel and mercurous iodide, corroborates to a considerable extent the results of the committee. The objectionable feature of it, noted by several of the members, that long-continued shaking is needed to bring the salt into solution, may be eliminated, it was found, by the simple change of adding the iodine solution first, instead of the potassium iodide. When this is done and the mixture at once shaken vigorously in a stoppered flask, solution is effected very quickly. The final result is the same in either case, as comparative trials have shown. It seems advisable, also, to increase the quantity of sample, to lessen the experimental error, in the case of calomel to about 1 Gm. The most satisfactory results were obtained when working in the following manner: To about 1 Gm. of calomel, accurately weighed, contained in a glass-stoppered 300 c.c.

Erlenmeyer flask, add 50 c.c. of N/10 iodine solution. Mix by rotating until the salt is thoroughly moistened, then add a solution of 2 Gm. of potassium iodide in 10 c.c. of water and at once shake the stoppered flask vigorously until solution is complete. Titrate the excess of iodine with N/10 sodium thiosulphate, using starch solution as indicator, adding the latter when the liquid is nearly decolorized. Each c.c. of N/10 iodine solution consumed corresponds to 0.02355 Gm. of mercurous chloride.

A sample of calomel, practically chemically pure, assayed by this method 99.5 to 100.0 per cent., the average of 6 determinations being 99.7 per cent., with some variation in the working details. Practically the same figures were obtained with yellow mercurous iodide containing slight traces of impurities.

The criticism of the Rupp method, that reduction of the mercury is not complete within a reasonable time without the use of heat and that, when heat is employed, the mercury is not easily dissolved afterwards, is well founded, if Rupp's directions in outlining the method (*Berichte d. d. ch. Ges.*, 1906, v. 39, p. 3702), be taken literally as regards the quantity of alkali to be used. While his directions lead to the inference that only enough is required to combine with the acids formed by the reaction, his figures in the same paper show that he used a decided excess, not less than 10 c.c. of normal solution for 0.2 Gm. of mercuric chloride. The divergent opinions regarding this method by the members of the committee are doubtless due chiefly to differences in the quantities of alkali used. When the above mentioned proportions are taken, the reaction is almost instantaneous, unless the solution is excessively diluted, and may safely be regarded as complete within 5 minutes, without heating. It will do no harm to use a still larger excess of alkali or to let the mixture stand longer. Shaken in a stoppered flask with the iodine solution, the precipitate is then dissolved very readily. A large excess of acetic acid is to be avoided, as it tends to make the result too low, which is also the experience of Mr. L. D. Havenhill, of the committee. The best results were obtained by carrying out the details as follows: Dissolve about 0.5 Gm. of powdered mercuric chloride, accurately weighed, contained in a glass-stoppered 300 c.c. Erlenmeyer flask, in a solution of 2 Gm. of potassium iodide in 10 c.c. of water. Add 25 c.c. of normal caustic alkali solution and 6 c.c. of 40 per cent. formaldehyde solution. Mix by swirling the flask occasionally during 10 minutes, then acidu-

late with about 5 c.c. of 36 per cent. acetic acid. Add 50 c.c. of N/10 iodine solution and shake vigorously in the stoppered flask until the mercury is dissolved. Titrate the excess of iodine with N/10 sodium thiosulphate solution, adding starch solution when the liquid is nearly decolorized. Each c.c. of N/10 iodine solution corresponds to 0.01355 Gm. of mercuric chloride.

Chemically pure mercuric chloride gave by this method 99.8 to 100.3 per cent., with an average of 100.1 per cent. in 5 determinations. Similar results were obtained with mercuric iodide, oxide, ammoniated mercury, and mixtures of mercuric chloride and ammonium chloride colored with aniline dyes. It is the official method of the German Pharmacopœia, 5th revision, 1910, for the assay of mercuric chloride tablets and ointment of ammoniated mercury.

The third method alluded to above consists in the titration of mercuric compounds, in nitric acid solution, with sulphocyanate in exactly the same way as the titration of silver. It is not applicable in presence of chlorides and probably not in presence of other halogens. It was first made serviceable for accurate work by R. Cohn (*Ber. d. d. chem. Ges.*, 1901, v. 34, p. 3502) and simplified by Rupp and Kraus (*Ibid.*, 1902, v. 35, p. 2015). For illustrations of its application see below. The writer has no personal experience with this method, but his associates have found it accurate and useful for the assay of technical mercuric oxide containing iron. The German Pharmacopœia uses it for the assay of several galenical preparations. For the convenience of any readers of this JOURNAL interested in this subject, who may not have access to this book, the assay methods for mercury preparations prescribed therein are given here:

Mercuric Chloride Tablets.—Composed of equal parts of mercuric chloride and sodium chloride, colored with aniline dye. Dissolve 2 tablets of about 1 Gm. each, accurately weighed, in water and dilute to 100 c.c. In 20 c.c. of the solution dissolve 1 Gm. of potassium iodide, add 10 c.c. of a 15 per cent. solution of potassium hydrate and 3 c.c. of a 40 per cent. solution of formaldehyde with 10 c.c. of water. After one minute add 25 c.c. of 30 per cent. acetic acid, 25 c.c. of N/10 iodine solution, and shake until the mercury is dissolved. Titrate the excess of iodine with N/10 sodium thiosulphate solution, using starch solution as indicator. Each c.c. of N/10 iodine solution consumed corresponds to 0.01355 Gm. of mercuric chloride.

Ointment of Ammoniated Mercury.—Consists of 10 per cent. of ammoniated mercury and white vaseline. Heat about 5 Gm. of the ointment, accurately weighed, in a small flask with 25 c.c. of 12.5 per cent. hydrochloric acid on a water bath. Mix frequently by rotating the flask during 10 minutes. Pour the acid liquid into a 100 c.c. flask, rinse the vaseline and flask repeatedly with water and dilute the combined liquid and washings to 100 c.c. Transfer 25 c.c. to a glass-stoppered flask, add 1 Gm. of potassium iodide and proceed further as directed for the assay of mercuric chloride tablets. Each c.c. of N/10 iodine solution consumed corresponds to 0.01257 Gm., approximately, of ammoniated mercury.

Mercuric Salicylate.—Contains about 55 per cent. of mercury. Dissolve about 0.3 Gm. of the salt, accurately weighed, in dilute sodium hydrate solution, acidulate with acetic acid, and add 25 c.c. of N/10 iodine solution. Let the mixture stand in a closed flask for 3 hours at room temperature, rotating it occasionally. Titrate the excess of iodine with N/10 sodium thiosulphate solution. Each c.c. of N/10 iodine solution consumed corresponds to 0.0100 Gm. of mercury.

Mercury Plaster.—Contains 20 per cent. of mercury; made with lead plaster, wool fat and yellow wax. Heat about 3 Gm. of the plaster mass, accurately weighed, with 20 c.c. of nitric acid, sp. gr. 1.38 to 1.40, in a flask having a wide neck and connected with a reflux condenser. Heat about 10 minutes or until mercury globules are no longer visible in the sandy deposit of lead nitrate, add 25 c.c. of water and heat again until the fat has separated, leaving the aqueous layer clear. Cool and pour the solution through a tuft of absorbent cotton into a 100 c.c. flask. Break up the disk of fat, rinse it and the flask with 4 or 5 portions of 5 c.c. each of water and to the combined liquids add potassium permanganate until permanently red or until brown flakes separate. Decolorize or clarify the solution by addition of ferrous sulphate solution and dilute to 100 c.c. To 25 c.c. of the solution add 2 c.c. of a 10 per cent. solution of ferric alum and titrate with N/10 ammonium sulphocyanate. Each c.c. consumed corresponds to 0.01000 Gm. of mercury.

Mercury Ointment.—Contains 30 per cent. of mercury; made with wool fat, peanut oil, lard, and mutton tallow. Proceed as directed for the assay of mercury plaster, using about 2 Gm. of the ointment and 20 c.c. of nitric acid.

Ointment of Red Mercuric Oxide.—Contains 10 per cent. of mercuric oxide; made with white vaseline. Proceed as directed for the assay of mercury plaster, using about 5 Gm. of the ointment and 20 c.c. of nitric acid. Continue heating until the red color of the mercuric oxide has disappeared. Each c.c. of N/10 ammonium sulphocyanate solution corresponds to 0.0108 Gm. of mercuric oxide.

The factors given throughout these notes are based on the atomic weights having O = 16 as the standard. If the volumetric solutions used are made by the H = 1 standard, either the factors or the final results should be multiplied by 0.992.

THE PHARMACOGNOSY OF ECHINACEA.[1]

By Henry Kraemer and Maud Sollenberger.

The root of *Echinacea angustifolia* has been used in certain proprietary medicines for a number of years. It was not until about 1886, however, that the identity of the drug was determined. From specimens of the entire plant which were sent John Uri Lloyd from Nebraska, his brother C. G. Lloyd was enabled to identify the drug as being derived from *Echinacea angustifolia,* or the "Nigger Head" of the West.[2] Apparently considerable quantities of the drug are used, and there are a number of reports to the effect that it is more or less adulterated. It should be stated that while the drug is largely used, the Council on Pharmacy and Chemistry of the American Medical Association[3] has investigated the subject and come to the conclusion that "Echinacea is deemed unworthy of further consideration until more reliable evidence is presented in its favor." However, the plant and drug have a number of interesting anatomical features, and it was deemed advisable to present the results of this study at this time. Authentic specimens of the crude drug were secured from Professor Lloyd. Living plants of *Echinacea angustifolia* were purchased from Mr. John Hellerman, who has been cultivating the plant in Philadelphia, and these plants

[1] Read at the New Jersey Pharmaceutical Association meeting, June 14, 1911.

[2] *Pharm. Review,* 1904 (vol. 22), p. 11.

[3] *Jour. A. M. A.,* Nov. 27, 1909; Report A. M. A. Council on Pharmacy and Chemistry, 1909, p. 144.

have been growing for some time in the garden of the Philadelphia College of Pharmacy and their identity established.

There are two species of *Echinacea* which are indigenous to the United States. These are known by botanists under the generic name of *Brauneria,* although Hoffmann, in the monograph of the Compositæ in Engler and Prantl's Pflanzenfamilien, still retains them under the genus, *Rudbeckia.* Thus we have the following botanical synonyms of the species that concerns us:

Rudbeckia pallida, Nuttall (1834).
Echinacea angustifolia, DeCandolle (1856).
Brauneria pallida (Nuttall), Britton (1904).

DESCRIPTION OF THE PLANT.

Brauneria pallida is a perrenial herb, somewhat resembling *Brauneria purpurea,* a plant that is quite extensively cultivated in the gardens, and known as the "Cone flower." The vertical rhizome and root of *Brauneria pallida* is, however, very much larger than those of the cone flower. The plant is from 3 decimetres to 1 metre high, the leaves are usually more or less crowded near the base of the stem, and from among them arises a long peduncled head of flowers. The leaves are for the most part rather narrow and lanceolate, pointed at both the apex and base, and with a very long petiole, the latter frequently being as long as the lamina. They are nearly entire, and with three prominent parallel veins. The flower heads are made up of both tubular and ray florets, the entire cluster being about 9 centimetres in diameter. The receptacle is conical and solid, and subtended by three series of imbricated bracts which are lanceolate, spinose, with an acute or acuminate apex, and appressed or slightly spreading. On the receptacle are borne numerous purplish tubular flowers, which are about 1 centimetre long and partly enclosed in a somewhat woody bract with a narrow attenuated apex which projects several millimetres above the flowers. The tubular flowers are perfect, the calyx being short and acute, the corolla tubular and the stigmas ellipsoidal. The achenes are obpyramidal and with a pappus, forming a short dentate crown. The ray flowers are of a purplish or rose color, narrow elliptical or linear, about 7 centimetres long, and with two or three acute teeth at the apex. The ray flowers appear to be neutral, and in addition to the spatulate corolla, possess a short calyx tube with five acute, rather short, serrate teeth.

DESCRIPTION OF RHIZOME AND ROOT.

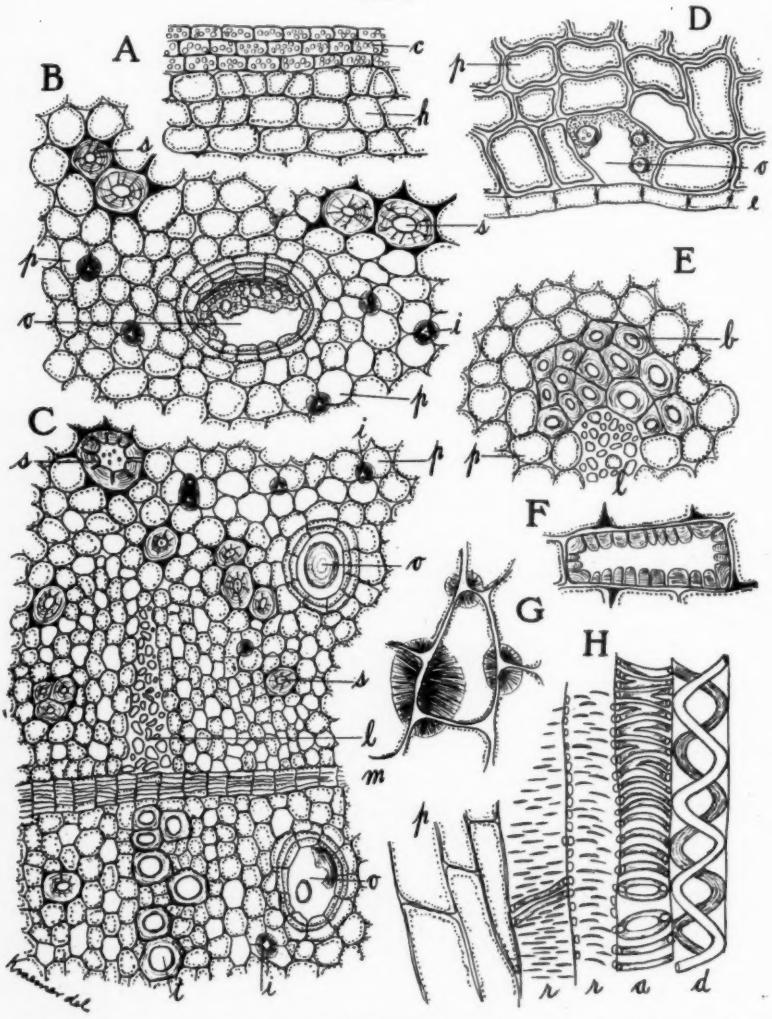
The crown of the rhizome is simple or branched, resembling that of other Compositæ. The underground stem, or rhizome, attains a length of as much as 12 centimetres, and is from 10 to 15 millimetres in diameter. It is slightly annulate, marked by a number of V-shaped stem scars and circular root scars, but otherwise it is nearly smooth and of a somewhat purplish-brown color. The root is continuous with the rhizome and extends downward, producing a number of irregular branches.

The commercial drug may be described as follows: Nearly entire, cylindrical, very slightly tapering, 10 to 20 centimetres long, 4 to 8 millimetres in diameter; externally, grayish brown, light brown or purplish brown, slightly annulate in the upper portion, with occasional V-shaped stem scars, somewhat wrinkled longitudinally, or furrowed and sometimes slightly spirally twisted; fracture short, fibrous; internally, bark less than 1 millimetre in thickness, wood thick and composed of alternate light yellowish and black wedges; the rhizome with a circular pith; odor faint, aromatic; taste sweetish, followed by an acrid and tingling sensation resembling that of aconite but lacking the persistency and numbing qualities of the latter.

MICROSCOPICAL STRUCTURE.

The outer portion of the rhizome and root (Fig. 1) consists of two to four layers of more or less tabular cork cells with somewhat thickened yellowish suberized walls, the cells being frequently filled with more or less spherical globules of a substance which may become changed to a granular form. Beneath these outer layers of cork occur six to eight rows of tangentially elongated cells with more or less thickened walls, which are usually rich in cytoplasm, and in which is frequently found a distinct nucleus. In among these cells also occur some intercellular (schizogenous) oil and resin cavities or reservoirs (Figs. 1, 4 and 5). Beneath this second layer occur from twelve to twenty rows of parenchyma cells of varying shape, among which are large intercellular oil reservoirs and numerous small stone cells (Figs. 1, 2 and 3). These stone cells are usually more or less elongated, and frequently ten to twenty times as long as they are wide. They are of considerable interest by reason of the fact that in the intercellular spaces and in some of the adjoining cells, occur blackish, carbon-like, resinous masses

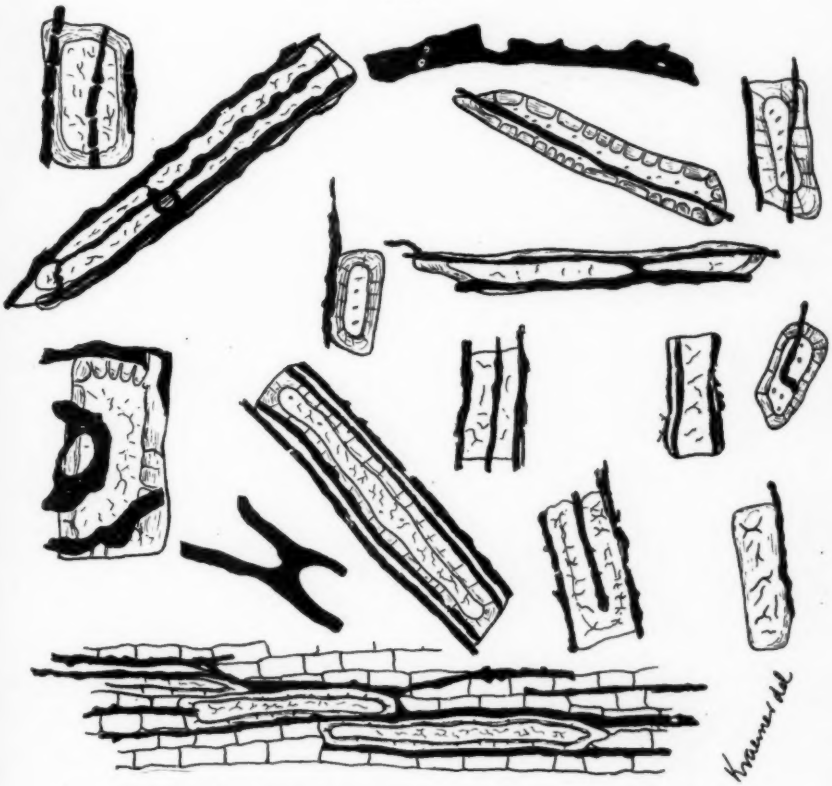
FIG. 1.



Echinacea; *A*, cross section of outer layers of root, showing cork (*c*) and hypodermis (*h*), *B*, cross section of cortex showing parenchyma (*p*), sphero crystals of inulin (*i*), and stone or sclerotic cells, and oleoresin reservoirs or canals (*o*). *C*, cross section of portion of fibro-vascular bundle showing leptome or sieve (*l*), cambium, (*m*), trachea or vessels (*t*), oleoresin reservoirs (*o*), stone cells (*s*), parenchyma (*p*) and inulin crystals (*i*). *D*, cross section near endodermis showing endodermal cells with suberized radial walls or Casparyan spots (*e*), endodermal resin canal (*o*), and parenchyma (*p*). *E*, cross section of underground stem or rhizome showing a group of bast fibres (*b*), leptome or sieve (*l*), and parenchyma (*p*). *F*, a sclerotic or stone cell. *G*, parenchyma with sphero crystals of inulin adhering to the walls. *H*, longitudinal section showing various forms of trachea or vessels; *d*, double spiral; *a*, annular; *r*, with simple pores; *p*, adjoining parenchyma.

which will be referred to in some detail later (Figs. 2 and 3). In the rhizome there is also included in this layer somewhat irregular tangentially elongated groups of bast fibres (Fig. 1, E), which give a strong reaction for lignin with phloroglucin. The walls of these fibres are not only lignified but are frequently very thick and almost transparent, very finely laminated and marked with a few simple

FIG. 2.



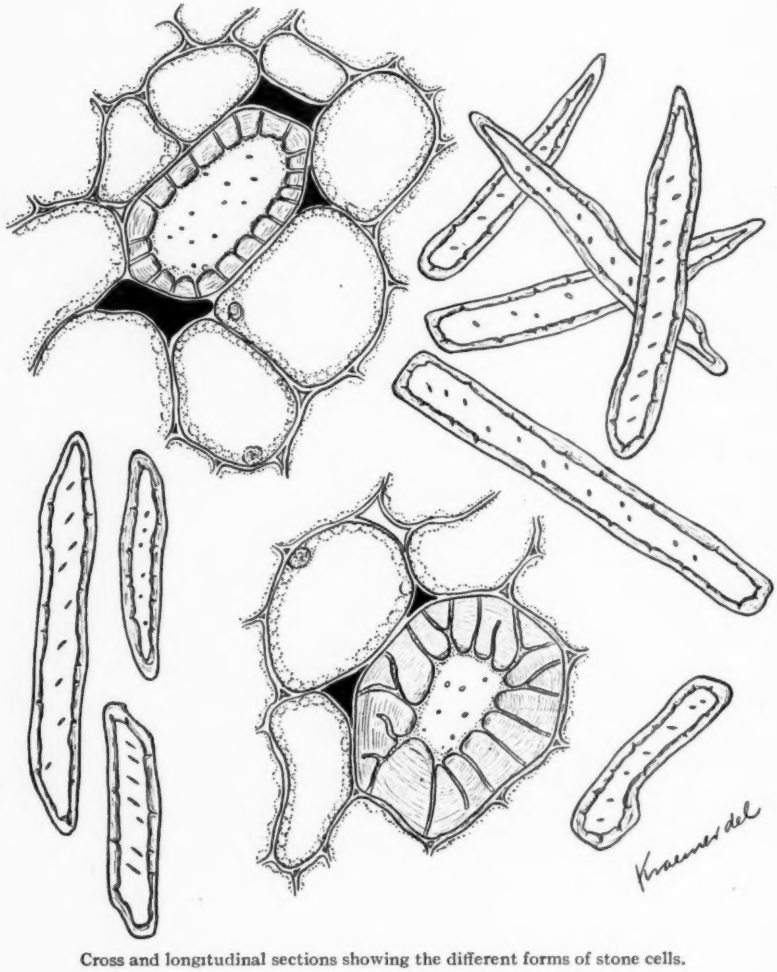
Stone cells showing the distribution of the black intercellular substance.

pores, which are more apparent when any of the ordinary reagents are employed.

The leptome or sieve extends in rays of varying width from the cambium to the outer bark, being bounded in the case of the rhizome by the bast fibres. In between these radial rows of sieve the tissue for the most part is parenchymatic and contains considerable inulin,

and the cells are interspersed with groups of from one to three of the characteristic stone cells already referred to, the groups being somewhat circularly disposed. The cambium zone is distinct, con-

FIG. 3.

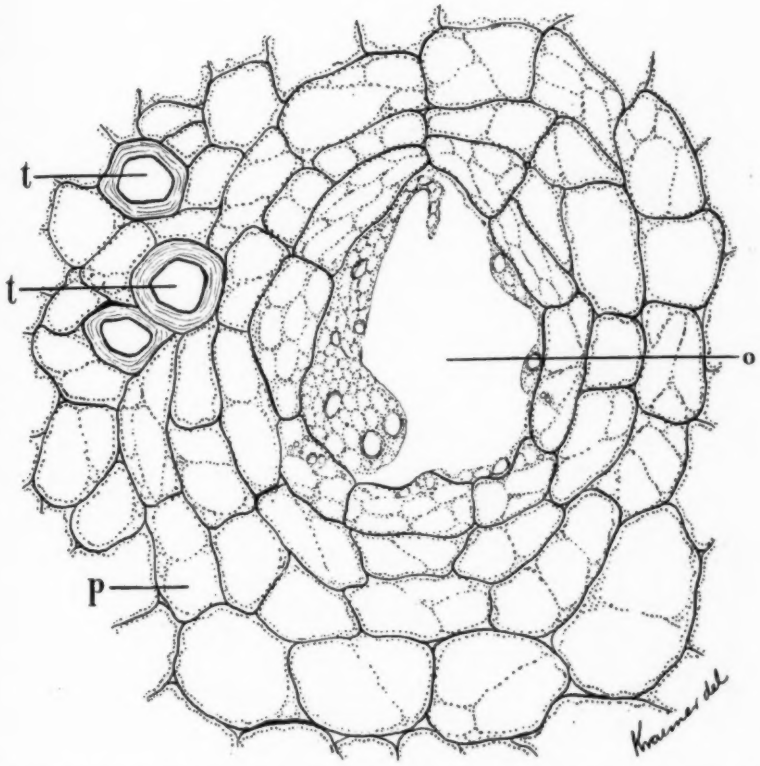


Cross and longitudinal sections showing the different forms of stone cells.

sisting of several rows of thin-walled cells. The xylem occurs in rays made up of small interrupted groups of tracheæ which are separated by wood parenchyma. The tracheæ are from eight to ten times as long as they are wide, the walls for the most part being

marked with simple slit-like pores, although annular and reticulate markings also occur. In between the xylem rays occur broad wedges consisting of from ten to twenty radial rows of parenchyma cells that are not of the type of medullary rays. Scattered among these cells are intercellular oil and resin reservoirs and more or less elongated stone cells similar to those already referred to. In

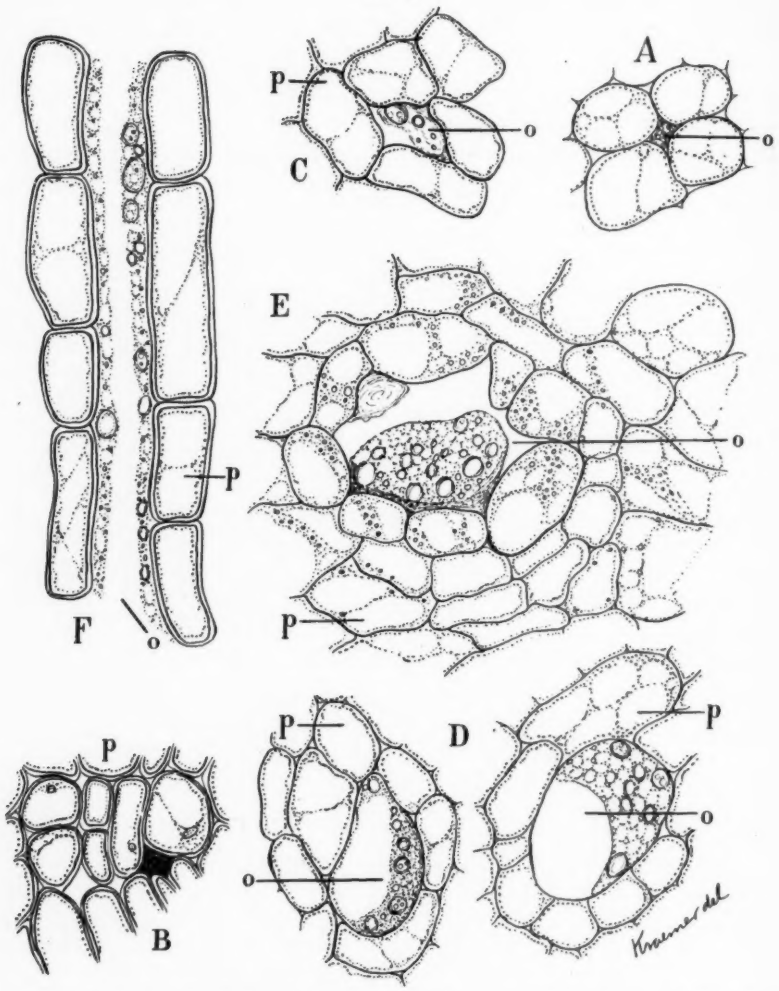
FIG. 4.



Cross section of root showing a large oleoresin canal (*o*), tracheæ or vessels (*t*), and parenchyma (*p*).

the xylem rays true wood fibres are also associated with the tracheæ in certain specimens collected in Tennessee and Missouri. The wood fibres are readily distinguished from the stone cells by reason of their position, more uniform outline and attenuated ends. In very young roots, in which the primary structure is still unchanged, the fibrovascular strand is of the triarch type.

FIG. 5.



Section showing development of oleoresin canals or reservoirs (*a*, *b*, *c*, *d* and *e*); *o*, oleoresin canals; *p*, parenchyma. *F*, longitudinal section showing an elongated secretory cell between the rows of parenchyma in the cortex.

INTERCELLULAR SUBSTANCE.

The Compositæ are usually divided for certain anatomical reasons, as well as for morphological differences, into two principal groups. In the one, viz., the Tubulifloræ, occur oils and resins, either in intercellular canals or secretory cavities. In the other,

namely, the Liguliflorae, the oils and resins are replaced by laticiferous tubes or vessels. In only one genus (*Gundelia*) of the Tubuliflorae are laticiferous tubes present, and while the root of this plant apparently contains resin canals, these are wanting in the leaves and stems. Again, in only one genus (*Scolymus*) of the Liguliflorae are oil canals present, as well as latex tubes (see DeBary, p. 137; and Engler and Prantl, p. 351).

The oleoresinous canals or reservoirs (Figs. 1, 4 and 5) found in *Brauneria pallida* are of the general type occurring in the Tubuliflorae. They are quite numerous and in some instances quite large, and are found in both the wood and the bark. The contents are of a light yellowish, amber-like color and of an oily or resinous consistence. There appears to be no relationship between the substance found in these oleo-resinous canals and the black substance present in most of the intercellular areas around the stone-cells. This latter substance is of a nearly uniform black color, insoluble in both sulphuric and nitric acids, and the ordinary solvents, such as alcohol, acetone and petroleum ether, etc. In longitudinal section, or upon treating the drug with Schultze's Macerating Fluid, it is found that this substance forms a somewhat coarse network, the material from a number of intercellular areas being more or less connected and the network resembling a septate latex tissue. Beyond this appearance there is no resemblance between the network of black intercellular substance and true laticiferous tissue. In some of the parenchyma cells of both the bark and the wood there may occur a black substance resembling this intercellular substance, which would seem to be in the nature of an excretion from some of these cells.

It should be stated, however, that in some of the longitudinal sections there was observed in the cortical tissue a number of elongated areas containing an emulsion of a yellowish oily or resinous substance. It could not be determined with certainty whether these were in the nature of elongated secretory cells or merely intercellular spaces into which had been secreted the oleo-resinous material. There are a number of facts which would seem to lead to the inference that they are probably in the nature of elongated secretory cells.

Some time ago Moser published an article on Echinacea and a Spurious Root, that appeared in the fall of 1909 (*A.J.Ph.*, 1910, p. 224). As he did not have an opportunity of studying authentic

material, or that derived from plants which were identified, his statements and description will need to be modified in order to accord with the facts here presented. Furthermore, the spurious drug described by him was really that of authentic material, as I have several specimens of the root from herbarium material of *Brauneria pallida* collected in Missouri and Tennessee, which are similar to the drug examined by him. Of course it is quite likely that other species of *Rudbeckia* or *Brauneria* may have some of the fundamental characteristics of *Brauneria pallida,* the root of which together with the underground stem or rhizome, is the source of the drug known as Echinacea.

FLUID EXTRACT OF ECHINACEA.[1]

By George M. Beringer.

Echinacea is one of the vegetable drugs that, in recent years, has attracted considerable attention in the medical profession, and appears to merit more extended study. By some its virtues are highly extolled, by others it is considered worthless. It is, however, to be noted that the condemnation is largely based upon the fact that certain chemists who made an examination of the drug had failed to isolate the active principle. We need not be surprised at this as the chemistry of many of the compositæ has been but little studied and very few alkaloidal or glucosidal principles have been isolated from drugs of this plant family.

The aromatic principles present in Echinacea are probably the source of its therapeutic action. The root has a characteristic aromatic, sharp and pungent taste, reminding one of the peculiar pungency of certain umbelliferous drugs such as lovage and angelica. It leaves a warm and tingling sensation in the mouth and is sufficiently irritant to produce a prickling sensation and a slight blistering effect on the mucous surfaces of the lips. This pungency and blistering effect is even more marked in alcoholic or hydro-alcoholic extracts.

Echinacea is a plant indigenous to the western plains of the United States. The professional use was preceded many years by

[1] Read before the New Jersey Pharmaceutical Association at Asbury Park, N. J., June 14, 1911.

that of certain aboriginal tribes. The Sioux Indians are said to have used it as a remedy in snake bites, insect stings, and in the healing of wounds. Its use in medical practice, to-day, is very much along the same lines. It is considered as a mild counter-irritant, stimulant and antiseptic, and as a remedy useful in blood disorders, typhus and meningitis and likewise recommended externally in the treatment of carbuncles, hæmorrhoids, wounds and impotency.

The fluid extract is the form in which the drug is commonly exhibited and its use certainly merits recognition and the fixing of an official standard therefor. It is proposed to introduce a formula for the fluid extract in the National Formulary. In connection with the work of revision of this legal authority, the writer has experimented with various formulas suggested for this preparation.

The views of manufacturers consulted showed a wide variation. While one recommended diluted alcohol for the menstruum another preferred 80 per cent. alcohol, and the recommendations of others fell between these extremes. This difference in the opinions of manufacturers accounts for the difference existing in the commercial products and shows the necessity for an official standard.

My experiments lead me to the conclusion that a menstruum weaker in alcohol than alcohol 2 volumes, water 1 volume, will not extract the drug. A menstruum of that strength appears to make a fluid extract of good body and color and taste, but it is not quite clear and some separation takes place. A menstruum of alcohol 3 volumes, water 1 volume, is a decided improvement over the weaker alcohol and shows only a very slight tendency to separation. The best result in my judgment is obtained with a menstruum of alcohol 4 volumes, water 1 volume, and is recommended for this fluid extract. To increase the alcohol beyond this strength seems unnecessary and yields a product lacking in body and no more aromatic than the menstruum preferred.

THE FIFTH REVISION OF THE GERMAN PHARMACOPŒIA.[1]

By George M. Beringer.

The appearance of a new edition of the German Pharmacopœia is always an important event in the history of pharmacy. The fifth revision of the Deutsches Arzneibuch has been published during the past year and became effective and the authority in the German Empire on January 1, 1911. Its publication on the eve of the Ninth Revision of the United States Pharmacopœia, adds materially to its importance.

Owing to the great number of our inhabitants who are of German birth or descent and also to the numerous American physicians who have been students in the German medical schools, the practice of medicine and pharmacy in this country, in many matters, largely follows the German.

The present revision marks the progress of professional pharmacy in Germany since 1900, when the fourth revision was published. Many of its departures are meritorious advances and will have marked influence on other pharmacopœial revisions, and its pronouncements are worthy of our careful study. I have no doubt that they foreshadow some of the principles and standards that will be adopted in the revision of the U.S.P. On the other hand, one is impressed by the fact that the U.S.P., 8th revision, was undoubtedly the model for some of the noteworthy changes in the latest German revision.

The object of the present communication is to direct attention to the more important features of the revision as the limitation of our meeting necessarily precludes a detailed review of the book.

As in the previous revisions it follows the custom of stating formulas, when not dosage forms, in parts by weight, even in the formulas for fluid extracts, and the finished products are given as 4, 5, 9, 10, 20, 50, 100 or 500, etc., parts. The uniformity of the U.S.P. in this respect is lacking in the German.

One of the noted departures in this revision is the style of giving formulas. The U.S.P. method of stating all the ingredients and quantities in the beginning of the formula and then following with

[1] Read before the New Jersey Pharmaceutical Association at Asbury Park, N. J., June 14, 1911.

directions is adopted in place of the method of the previous revisions wherein each item was preceded by the amount printed in words and the process was elaborated throughout the formula.

In the monographs on drugs and chemical products the style of treatment more closely simulates that of the U.S.P. VIII. The purity rubric has been adopted and is quite generally given in the chemical products. Here, however, one notes a lack of uniformity. For examples, Potassium bromide "must contain not less than 98.7 per cent. of pure KBr" (U.S.P., 97 per cent.) and Potassium carbonate "in the neighborhood of 95 per cent. pure K_2CO_3" (U.S.P., 98 per cent.), but the monographs on Potassium Iodide, Potassium Bicarbonate, and Potassium Nitrate, as well as those of other salts, lack entirely such statements of the purity requirements. This shows a lack of co-ordination of the work of the revision or a failure to adhere systematically to what appears to have been intended as one of the advanced thoughts to be adopted in the work.

The purity rubric is extended to many of the drugs and even to some of the galenicals. Here the method of stating the purity requirement at the very beginning, preceding even the definition of the drug or the process of the preparation, does not appeal to the writer as an improvement over the U.S.P. method of including the alkaloidal standard as part of the definition. It strikes us as odd to see as the initial statement in Cantharides "contains not less than 0.8 per cent. cantharidin," and in Cinchona "contains not less than 6.5 per cent. alkaloid, consisting of a mixture of quinine and cinchonine," or in oil of Lavender "contains not less than 29.3 per cent. Linalylacetate," and in Extract of Hyoscyamus "contains 0.5 per cent. Hyoscyamine" (U.S.P., 0.3 per cent. mydriatic alkaloids.

In the official titles, many of the old time-honored Latinized vernacular names are retained and such mediæval titles as "Borax," "Cerussa," "Lithargyrum," "Minium," still appear in this twentieth century revision.

The German method of spelling Latinized chemical names is retained in the official titles. As examples, Baryum chloratum with the German synonym as Baryum chlorid, Kalium chloricum with Kalium chlorat as synonym and Morphinum hydrochloricum with morphin hydrochlorid as the German. This has always been confusing to the English-speaking nations.

The method of classifying titles so that the official barks, leaves,

flowers, roots, rhizomes, etc., appear together, is retained, and in each drug the title indicates the part of the plant official. A few changes in titles are specially noticeable. Folia Hyoscyami replaces Herba Hyoscyami and Rhizoma Rhei, the former Radix Rhei; Formaldehydum solutum is changed to Formaldehyd solutus, and Paraldehyd now appears in place of "Paraldehydum." A noteworthy change in title as well as in composition is Lanolinum, which now becomes a mixture of wool fat 15, water 5, and liquid paraffin 3 parts, with "water containing wool fat" as the synonym and the old title Adeps Lanæ cum Aqua, for a mixture of wool fat 75 and water 25, is dismissed. The Unguentum Adipis Lanæ is also dismissed, the evident intent being that the new Lanolin shall serve for both of these old formulas.

The German Pharmacopœia recognizes the fact that the commercial chemicals sold for many purposes are legitimate subjects for its consideration and standardizing. We find such articles as crude sulphuric acid, crude copper sulphate, crude iron sulphate, crude potassium carbonate, and crude zinc oxide treated in suitable monographs.

Nor in the consideration of vegetable drugs does the German Pharmacopœia restrict its standards to the ingredients of physicians' prescriptions. It recognizes the necessity for proper definition for such common drugs as lavender flowers, chamomile, elder blossoms, mullein, coltsfoot, walnut leaves, sage and foenugreek which, while only occasionally dispensed on physicians' prescriptions, are largely used in domestic practice and become not an inconsiderable portion of the dealings of the druggist.

The International List of Atomic weights for 1910 is adopted as the basis for the chemical formulas, molecular weights, and the analytical calculations. This is the first revision of the German Pharmacopœia in which chemical formulas are given. Empirical formulas are tabooed and throughout structural formulas are used. While in many places simple structural formulas, like those of the U.S.P. VIII, are given, in others more elaborate formulas are presented. This is shown in the extreme in Theophyllin or Theocin where a modified graphic structural formula is given and a definition is omitted. This laxity of official definition is shown in a number of the monographs especially those describing organic chemicals and alkaloids.

The introduction of formulas and processes for the manufacture

of such chemicals as the nitrate, subgallate, subnitrate and subsalicylate of bismuth, calcium phosphate, iron and quinine citrate, quinine tannate, etc., seems strange to us in the light of present-day experience and economic conditions. Modern division of labor has rendered such manufacture unprofitable for the pharmacist, even if he should be equipped with the facilities to undertake it.

A very commendable feature of this revision is the introductory chapter devoted to official methods to be followed in the making of such determinations, as melting point, congealing point, boiling point, ash, acid number, saponification value, ester value, iodine absorption, etc.

Specific gravity, unless otherwise stated for special reasons, is taken at 15° C. compared with distilled water at 15° C. The U.S.P. VIII has not been followed by a single pharmacopœia nor by the U. S. Government departments in the adoption of 25° C. as the temperature for such determinations and the writer personally doubts if we really assumed "an advanced" position in adopting 25° C. or if we are now justified in retaining it alone against all pharmacopœial and other scientific authorities.

Polariscope readings are by sodium light at a temperature of 20° C. unless otherwise stated. In essential oils the figures are for reading with 100 mm. tube.

Microscopic measurements are stated in microns the μ being equal to 1/1000 mm.

The degree of fineness of drugs is indicated by a scale of numbers varying from No. 1 to No. 6, No. 1 being coarsely comminuted drugs passing through a sieve whose meshes are 4 mm. apart, and No. 6 being finely pulverized drugs passing through a sieve whose meshes are about 0.15 mm. apart.

For counting drops the normal drop counter of the Brussels Conference is adopted, and the method of stating doses is retained as in the previous revision, namely, the largest single dose and the largest daily dose.

Possibly the greatest advance is shown in the monographs treating of the organic drugs. Here we note first the innovation of giving the botanical authorities for the plant names, and these are quite generally the more recently accepted authorities. Secondly, and most praiseworthy, is the microscopic descriptions so generally included. These evidence the great advances made in the science of pharmacognosy since the last revision. Another commendable feat-

ure is the statement of ash content quite generally given. The method of stating the amount of alcohol soluble content in such drugs as asafetida and benzoin is to be commended as clear and worthy of copying in the U.S.P. Our Pharmacopœia directs that benzoin be "almost wholly soluble in 5 parts of warm alcohol." The German Pharmacopœia that "on thorough extraction with boiling alcohol the residue on drying must not exceed 5 per cent. of the benzoin."

The Ph. Gr. requires for asafetida that "on thoroughly extracting with boiling alcohol, and drying the residue at 100° C. it should not exceed 50 per cent. of the amount taken. The ash is limited to "not over 15 per cent.," the U.S.P. states "not less than 50 per cent. should dissolve in alcohol," and the ash limit is not more than 10 per cent.

Assay processes are greatly extended and improved and new ones are added for a great many articles not heretofore assayed. As examples of the extent to which assaying has been extended may be mentioned mustard paper and pomegranate bark. The selection of the articles assayed, however, is not readily understood. As, for example, assays are given for oils of cinnamon, lavender, santal and mustard, the latter being the synthetic oil, yet no assays are given for oils of anise, lemon, peppermint or rosemary equally important and assayable. In the alkaloidal assays where the alkaloid is estimated by titration iodeosin is the indicator commonly directed. Where assay processes are not available, not infrequently identification tests are given. As example, Bornträger's reaction for oxymethylanthroquinones is given as a characteristic test for the fluid extracts of frangula and cascara sagrada.

The attempt to follow the protocol of the Brussels International Conference is evidenced not only in the adoption of the Normal Drop Counter recommended but also in the adoption of many of the formulas and standards for potent drugs. Such adoption is indicated by a subtitle in Latin with P. I. appended. However, there are a number of instances where deviation in menstruum from the international 70 per cent. alcohol is made, yet the P. I. is appended. Example, Tinctura Cantharidis and Tinctura Iodi in which alcohol is directed. In a number of other cases where some deviation has been allowed the P. I. is not appended as, for example, Tincture of Aconite, although 10 per cent. drug is not indicated as international probably because no assay is given. Nux Vomica and

Strophanthus are not marked P. I. yet the tinctures made therefrom are both marked P. I.

To Tincture of Colchicum is appended the instruction that when Vinum Colchici is directed the tincture is to be given therefor and to Tincture of Ipecac is a similar instruction given that when Vinum Ipecacuanhæ is ordered the tincture is to be dispensed. The wisdom of such modification of physicians' orders is not above question and also the consistency of an agreement that "a potent medicament should not be prepared in the form of a medicinal wine" and then the same convention immediately proceeded to adopt an international standard for wine of antimony. Is there any reason why Vinum Ipecacuanhæ should be eliminated from medical practice and "Vinum Stibiatum" retained?

The admissions to the official list are interesting and while some are but little known or used in the United States others are extensively used. In the selection of pharmacopœial titles the Germans are not handicapped by product patents and trade-mark laws, and if the chemical name is too lengthy or not suitable for an official title they simply take the common or trade name, even if considered proprietary, and adopt it as the official title. This is shown in the present revision by the adoption of such titles as Stovaine and of Anæsthesin for para-amino-benzoic-ethylester. Even when the chemical name is Latinized as the official title the common or trade-mark name is given as an official synonym. Thus under Acidum Acetyl-salicylicum, Aspirin is so given and under Acidum diacetylbarbituricum, veronal is stated as the synonym. Among the other more important admissions we note dionin, heroin, colloidal silver, silver proteinate, beta eucaine, lactophenin, arsacetin, atoxyl, novacaine, phenolphthalein, tropacocaine hydrochloride, theocin synthetic and suprarenin hydrochloride which latter may be either the natural from the gland or the synthetic which is of doubtful value. Some of the additions such as gallic acid, guaiacol carbonate, hexamethylene tetramine, solution of hydrogen peroxide and cascara sagrada are so well established in American practice that we think our German friends at least a decade slow in their adoption. Concerning cascara an inconsistency in the title is shown; the drug is recognized as "Cortex Rhamni Purshianæ," yet the fluid extract is entitled "Extractum Cascaræ Sagradæ fluidum."

Collemplastrum is a new title for the rubber adhesive plasters and two formulas are given collemplastrum adhæsivum and col-

lemplastrum zinci, for the two popular plasters, surgeons adhesive plain and with zinc oxide. Their formulas contain caoutchouc, wool fat and copaiba balsam, with powdered orris root as a filler, and are well worth experimenting with as a substitute for our official adhesive plaster that is never made.

Peanut oil is introduced and is directed as an ingredient in some of the plasters, ointments and liniments, but it is to be noted that for camphorated oil the German Pharmacopœia still adheres to olive oil.

Among the articles dismissed we note hydrobromic acid, dried egg albumin, tar water, ferric chloride, jaborandi, poppy capsules, vanilla, solution ammonium acetate, syrup of poppy, wines of colchicum and ipecac.

The galenical preparations are classified into numerous distinctive classes and each class is headed by a short descriptive paragraph or chapter setting forth its definition and such general instructions as are appropriate.

The German still lovingly adheres to his idol, maceration, and percolation, as yet, receives but scant consideration in his pharmacopœia. While percolation is directed in a few formulas such as the fluid extracts, where the rate of flow is fixed at 30 drops per minute, yet in other important extractions such, as for example, Extract of Nux Vomica, maceration and expression is directed.

The requirements or some of the important articles are briefly given so as to be compared with those official in the U.S.P.

Alcohol is 91.29 to 90.09 per cent. by volume.

Diluted Alcohol is 69–68 per cent. by volume, thus corresponding closely with the 70 per cent. alcohol recommended by the Brussels Conference as a universal menstruum for tinctures of potent remedies.

Acid Benzoic is the sublimed and from Siam Benzoin, and tests are given to detect the synthetic. The U.S.P. recognizes both with preference for the synthetic.

Acidum Carbolicum is still retained as the title for " Phenol."

Hydrochloric Acid remains " about 25 per cent. HCl " and the diluted 12.5 per cent.

Phosphoric Acid remains 25 per cent. H_3Po_4; the U.S.P. is 85 per cent.

Aloe is restricted to the inspissated juice of the leaves of " African species of Aloe " with omission of the exact botanical source.

Ammonium Carbonate like the U.S.P. is the academic statement rarely if ever found in commerce.

Cantharides is required to contain 0.8 per cent. of Cantharidin. The assay process has been improved by recrystallizing the product from Acetone, but it still does not yield a colorless and pure product.

Sulphuric Acid is 94 to 98 per cent. H_2SO_4, the crude 91 per cent. and the diluted 15.6 to 16.3 per cent.

Capsules are described as of two forms, the platter or cup-shaped made of wheat flour or wheat starch, and the hollow gelatin capsule.

Catechu is retained; no Gambir for the Germans.

Cinchona is restricted to the Bark of Cinchona Suiccirubra Pavon.

Quinine Sulphate: The chemical formula is given as containing 8 molecules of water. The U.S.P., while giving the formula as $7H_2O$, in the text allows a loss in drying, "indicating not more than 8 molecules of water."

Cinnamon: The Ceylon bark replaces the Chinese and the oil of Ceylon Cinnamon is now the German official oil of cinnamon.

Fluidextracts: But four new ones have been added, namely, cascara, cinchona, granatum and simaruba. The Cinchona contains 17 parts of Diluted Hydrochloric Acid in 100 and is essentially the formula of the British Pharmacopœia.

Sassafras is the wood of the root.

Solution of Iron Albuminate: Fresh hen's egg albumin replaces the dried of the previous edition. The variability of the commercial dried albumin and disagreeable odor possessed by many samples necessitated this change.

Liquor potassii hydroxidi and Liquor sodii hydroxydi are both "about 15 per cent." while the U.S.P. are only about 5 per cent.

Magnesium Carbonate: Two chemical formulas are given showing varying mixtures of magnesium carbonate and hydroxide, the one with 3 molecules of H_2O and the other with 4. The U.S.P. gives the latter formula but with 5 molecules of water. Probably both authorities give academic formulas that do not describe the trade article.

Opium is required to contain "not less than 12 per cent. of morphine after drying at 60° C." It would be rather difficult to dry a substance like opium uniformly at that temperature.

Powdered Opium is required to contain 10 per cent. of anhydrous morphine. The U.S.P. standard 12 to 12.5 of *crystallized* morphine varies but slightly from the international agreement.

Pill of Aloes and Iron, very similar to the U.S.P. formula, is retained.

Sarsaparilla is continued as the " Honduras " variety.

Taraxacum is the " root with herb " collected in the spring before flowering.

Artificial Carlsbad Salt remains in the German Pharmacopœia. This is an N.F. preparation that has been severely criticized because a factitious product.

Sapo Kalinus remains quite properly a linseed oil soft soap.

Scopolamine hydrobromide is the lævarotory " hyoscine," and the latter title is not given.

Ergot is directed to be kept for not more than one year, and not kept in the powder form, but powdered as needed.

Strophanthus: Seed of S. kombe Oliver only, but in the tincture the protocol is blindly followed despite its error, and a 10 per cent. drug tincture is made with 68 per cent. alcohol and the seed not previously defatted.

Nux Vomica: The standard is 2.5 per cent. mixed alkaloids strychnine and brucine, of which it is assumed that a little more than half is strychnine.

Serum Antidiphthericum: Here the serum antitoxin and the dried antitoxin are recognized but the concentrated globulin form which is so extensively used in the U. S. is not mentioned.

Physiological Salt Solution is given as Sodium Chloride 8. Sodium Carbonate 0.15, water 991.85 parts, filtered and sterilized.

Spirit of Lavender is directed to be made by macerating for 24 hours 1 part lavender flowers and alcohol 3 and then distil off by the water bath 4 parts. This is an impossible formula and evidently there has been an omission of the 3 parts water directed to be added in the 4th Revision.

Tincture of Ipecac: A new introduction to meet the theoretical user of the P. I.

Each formula is accompanied by a description of the product and not infrequently this gives in addition to the color, consistence, taste, etc., also the specific gravity and the percentage of extractive and ash, and any distinctive characteristic reaction or test.

Several of the important features of this revision are contained in the chapters of the appendix. The first being the list of elements and atomic weights. The second is the chapter on reagents and volumetric solutions. The third chapter is a list of reagents and

volumetric solutions for medico-chemical examinations. This is one of the most commendable features of this revision and places in a compact schedule these reagents and tests and should prove a valuable aid to the busy practitioner or pharmacist. The classification here is according to the subjects of investigation, the first sub-heading being the reagents for urine analysis, and this is sub-divided under paragraph headings directions for albumin, for sugar, for pentoses, for acetone, for acetic acid, for urobilin, for urobilinogen, for gall coloring matters, for indican, for carrying out the diazo reaction, for iodine, for salicylic acid and for blood. The second classification is for the investigation of stomach contents. The third for the examination of blood. The fourth is for the examination for bacteria and protozoa, and here formulas are given for the necessary stains and reagents and the standards are here given for the cedar oil, Canada balsam and xylol suitable for microscopic investigations.

Another chapter of the appendix is a table of specific gravities of the official liquids at temperatures from 12° to 25°. Although doses are given with each monograph or formula in the body of the book, a table of maximum doses for adults is given in the appendix. Another table is devoted to a list of the deadly poisons that must be kept under lock and dispensed with great caution. Still another table is devoted to other less poisonous or dangerous medicaments that one should beware of. An extensive list of synonyms and less used names is one of the important tables included in the appendix.

THE LACTIC ACID ESTER OF SANTALOL AND OTHER SANTALOL COMPOUNDS.[1]

By Frédéric S. Mason, B.Sc., Ph.G., M.D., New York.

I should have liked to have introduced the subject of my paper by a short review of the history of sandalwood and its oil, for with ambergris and musk, sandalwood is one of those natural products used from very remote ages in perfumery and medicine. I have been interested in sandalwood for over twenty-five years, having been one of the first to make an investigation of the sources of supply in India, Malaysia, Timor and Western Australia, which countries I visited on two occasions for the specific purpose of determining the cause of the variations observed in the laboratory,

[1] Read before the New York section of Am. Chemical Society, 5th May, 1911.

when examining the oils obtained from wood bought on the London market. In recent years, a peculiar malady called in Mysore "spike disease" attacked the sandalwood; parasitic roots of other trees attaching themselves underground to the sandalwood roots even at from one to one hundred feet distance. This disease at one time bid fair to exterminate these valuable trees, but the Mysore government, which derives an important revenue from this source, is now engaged in heroic efforts to save them.

My time, however, being limited to twenty minutes, I refrain from enlarging on this subject and must refer those who are interested to the contributions to materia medica which I have published from time to time in the *Pharmaceutical Journal* of Great Britain, and more recently in the American edition of the *Tribune Medicale* of November, 1909.

It is now recognized that the most valuable oil is obtained from the heart wood of the true *Santalum album* growing on the highlands of Mysore in Southern India, and it is with this product that I am dealing in the present paper.

In confirmation of what I have already published on sandalwood oil distilled in India, I will quote from Schimmel's Semi-annual Report of October, 1910, since it confirms much that I have already written on the Sandalwood of Mysore, although reference is here made to an outlying territory: "The distillation of sandalwood oil appears to be an ancient industry in Southern Kanara, especially in the district of Udipi, but it is steadily declining. Natives from Udipi attend the auctions in Mysore and Coorg every year, and attract attention by their bids, which are often extravagantly high, especially for Coorg wood. But not all the wood bought by these dealers is distilled by them: a portion of it they resell to Bombay. It is said that the distillers also use smuggled wood (sandalwood being a monopoly of the State of Mysore), besides which sandalwood trees may occur here and there in the district of Kanara.

"The oil industry is centred principally in the district northeast of Karkul up to the foot of the Ghats.

"For distilling purposes, the wood is cut into chips and placed in the still. Water is then added and the distillation of the same charge is continued uninterruptedly day and night for a whole month. Fresh supplies of water, consisting of the luke-warm water taken from the cooling vessel, are poured into the still about 15 times every 24 hours. The oil-yield is said to be as follows:

Roots	about	4.34%
Jugpokals	"	3.47%
Ain Chiltas	"	2.60%

"The oil is partly brought to market at Udipi and partly at Mangalore. Almost all the oil is shipped by steamer to Bombay, whence it is exported to the Persian Gulf and to China.

"It hardly needs to be pointed out that under the primitive conditions of distillation which have been described, it is impossible to obtain any really good sandalwood oil. Owing to the prolonged duration of the distilling process, decomposition-products must necessarily be formed, which must injuriously affect the quality of the oil and be equally unfavorable to its color and odor."

Santalol, in two isomeric forms, occurs as the alcohol of the East India sandalwood oil, and is recognized by all therapeutists as the chief active component of this oil. The older pharmacopœias have been content to establish a standard based on the specific gravity and its solubility in alcohol, but the present U.S.P. requires 90% of santalol and states that the oil is lævogyrate—its angle of rotation should not be less than — 16° nor more than — 20° in 100 Mm. tube, at a temperature of 25° C. This differentiates the true oil of the *Santalum album* (N.O. Santalaceæ) from those derived from species of sandalwood or adulterated with cedar and other spurious oils.

Chapoteaut, in 1879, read a paper before the Paris Societé de Chimie, and was the first to call attention to the fact that sandalwood oil was composed chiefly of alcohols, from which he was able to make a series of esters with appropriate acid anhydrides. The empirical formula of the santalol he then referred to, he determined to be $C_{15}H_{26}O$. He also isolated another body, to which he ascribed the formula $C_{15}H_{24}O$, and these findings were verified by Chapman & Burgess (*Proceedings of the Chemical Society,* London). Parry followed up Chapoteaut's work some years later, and Continental chemists have since shown that the pure oil is chiefly composed of a mixture of the santalols together with two isomeric sesquiterpene alcohols. Guerbet speaks of an alpha- and beta-santalene, which both combine slowly with glacial acetic acid when heated in sealed tubes. The hydrochlorides of santalol $C_{15}H_{24}2$ HCL, have an optical rotation in an opposite direction to the original sesquiterpenes, that of the alpha-santalene hydrochloride being 6° 1′, and that of beta-santalene hydrochloride 8°. Alpha-santalene gives only one crystal-

line nitrosochloride at 122° C., and is insoluble in alcohol. Beta-santalene gives two isomeric nitrosochlorides, both of which are soluble in alcohol. The two santalols, isolated together from other constituents of the oil as phthalic esters, can only be separated from each other after saponification by fractional distillation under reduced pressure. Thus obtained, the alpha-santalol boils at 300°–301° C. (as pointed out by Chapoteaut in his first paper of this subject), has a density of 0.9854 at zero centigrade and a rotation of — 1° 20′. Beta-santalol boils at 309°–310° C., and has a density of 0.9868 at 0° C. and the rotation is — 56°. Dehydrating agents, such as acid potassium sulphate or phosphoric anhydride, remove a molecule of water, converting them into their respective isosantalenes $C_{15}H_{24}$. Alpha-isosantalene boils at 259°–260° C., so that the alpha and beta compounds approach very nearly to the essences of copaiba and cedar. Hugo and Soden have also given considerable time to the examination of sandalwood oil. F. Muller claims to have isolated a new terpene C_9H_{14}, which he calls santene. This has a Sp. gr. of 0.871, and boils between 139°–140°. It forms two polymeric crystalline nitrosochlorides, one blue and the other colorless. It also gives a solid hydrochloride melting at 80° C., thus conforming with the reactions of other terpenes. This terpene is probably derived during distillation from teresantalic acid, since when that acid is heated under a reflux condenser, CO_2 is found to be given off and on distilling, santene is obtained. Muller also found a ketone, santalone $C_{11}H_{16}O$, boiling at 214°–215° C., isomeric with jasmone.

To summarize, the following definite compounds have been isolated from sandalwood oil: (per kilogr.)

Santalenes "a" and "b"	60
Santalols "a" and "b"	800
Santalal	30
Acids in the state of esters (formic, acetic, santalic, teresantalic)	30
Undetermined strongly odorous bodies boiling at 130°–220° C.	3
Undetermined products boiling about 320° C. (hydro-carbons, alcohols, ethers, resinous products)	77
	1000

From a series of examinations made by Sodan and Muller, these authorities suggest the following constants for sandalwood oil:

Specific gravity	0.975 to 0.982
Optical rotation	16° to 20°
Refraction index	Not below 1.5030
Santalol (total)	At least 90 per cent.
Esters as santalyl acetate	4 to 6.5 per cent.
Rotation of first and second fractions of 10 per cent.	Not below 16°

Sandalwood oils found on the drug markets of London and the Continent are now sold with a guarantee of 94 per cent. of santalol, but this guarantee should not be taken too seriously, since repeated examinations of various brands show that they vary between 90.9 and 93.6 per cent. of santalol with from 1.5 to 6 per cent. of the esters of santalol. Occasionally an oil is found which gives as high as 98% of santalol. These variations explain the variable specific gravity of the oils found in commerce. The U.S. Pharmacopœia gives the specific gravity as .965 to .980 at 25° C. We see, therefore, that the requirements of the U.S.P. are moderate and allow for variation in the percentage yield of santalol.

Since the santalols are responsible for the medicinal effects of sandalwood oil, it is with these definite products that we have chiefly to deal. Sandalwood oil and santalol, however, are not well tolerated by most patients, and chemists have, in recent years, attempted to form compounds with these alcohols in order to obtain less irritating esters, while retaining their beneficial medicinal effects. Many processes have been patented, the patentees claiming that santalol esters are better tolerated and less objectionable in taste, while their therapeutic activities are retained. The general principle for the production of these esters is to act on the santalol with an anhydride or by obtaining compound esters by action between a santalol halogen and an alkaline ethylate, phenylate, etc. Solid esters in fine white crystalline needles, such as the santalol ester of allophanic acid, containing 72 per cent. of santalol, have been obtained. The neutral esters of the aromatic acids, however, are the best known, and amongst the rather long list, the following have had a passing notice and are used to some extent: Santalol benzoate, salicylate, cinnamate, succinate. A phosphate has also been obtained.

As these santalol compounds are incompatible with alkalies, the

theory of their activity is based on the supposition that the alkalinity of the duodenum breaks them up, liberating nascent santalol. The therapeutic dose, however, has to be somewhat increased according to the molecular weight of the ester. These compounds of santalol are known under various trade names and need not enter into discussion here.

In considering a compound of santalol for medicinal use, we should look for one which will not interfere with the gastrointestinal digestive processes and which will be finally eliminated during metabolic changes, as santalol, Co_2 and H_2O. This I think is best realized in the lactic acid ester of santalol ($CH_3CHOHCOO$, $C_{15}H_{25}$), which represents 69.74 per cent. of pure santalol. It has the advantage of being more agreeable to the taste than sandalwood oil or santalol, it is well tolerated and can be administered in the form of capsules. Like other lactates, the lactic radical is completely consumed in the economy. It renders the urine somewhat alkaline, diminishes the overstimulation of the renal parenchyma and does not occasion the pain in the back so often complained of by patients to whom sandalwood oil is administered.

While lactic acid does not react directly with santalol, its primary and secondary anhydrides, the so-called lactid, do so under certain conditions, and a patent has been granted for the process of manufacture of the santalol lactate in the United States and England and is pending in Germany and France. In practice, this is obtained by driving off from syrupy lactic acid 25 per cent. of the compound with water, leaving the primary and secondary anhydrides, the dilactic anhydride of Pelouse, or lactid, which is solid to 25° C.

It is an advantage to use a slight excess of the lactid over and above the theoretical combining molecular weights and this leads to some difficulty in the purification of the final product, which is one of the essential points of the patent, for it is exceedingly bitter and disagreeable to the taste and can only be removed from the santalol lactate with difficulty. Primary and secondary lactic anhydrides, therefore, are placed in contact with the santalol, in the molecular proportions necessary for chemical combination and heated in a partial vacuum to a temperature not exceeding 130° C.

For therapeutic use, and for reasons of economy, it is considered unnecessary to obtain an absolutely pure santalol lactate, and in its manufacture, U.S.P. sandalwood oil containing at least 90% santalol was used, rather than pure santalol.

As the result of a number of experiments, the following was found to yield a santalol lactate of from 92 to 95% purity (according to the percentage of santalol in the sandalwood oil used) and was finally adopted:

Sandalwood oil in the following proportions (weight) 110 grams (equivalent to 100 grams santalol in the sample) and 120 grams of solid anhydrides (lactid) of lactic acid, were placed in a flask attached to a Liebig condenser. Heated in a partial vacuum to 108–110° C., a primary reaction occurs with ebullition. The temperature was then gradually raised to 125–130° Cent., when a more violent secondary reaction took place. The temperature was maintained at 130–135° C. for twelve hours. There was no distillate at this temperature. The contents of the flask were then boiled repeatedly with distilled water for several hours to remove the bitter taste of the excess of lactic anhydride present.

The product was washed with a 1% solution of $NaHCO_3$, then with 1% HCl; washed again with distilled water until it gives no opalescence with $AgNO_3$, filtered and estimated for the proportion of combined santalol and lactic acid.

THE THEORETICAL PERCENTAGE COMPOSITION OF SANTALOL LACTATE.

Santalol "A" and "B" $C_{15}H_{25}OH$ (molecular weight 220.53), combines with lactic acid $CH_3CHO\ HCOOH$ (molecular weight 89.37) or as lactid $C_3H_4O_2$ (molecular weight taken as 72), to form a monobasic compound of santalol lactate $C_3H_5O_3$, $C_{15}H_{25}$ (molecular weight 291.90).

The theoretical percentage of the lactic radical in santalol lactate therefore is 30.28.

The theoretical percentage of santalol in santalol lactate therefore is 69.74.

The findings of a series of 14 analyses show that the product made by my process closely approximates these figures.

The lactic acid ester of santalol has the following characteristics:

It is reddish brown in color, possesses a sp. gr. of from 1.050 to 1.065, is neutral in reaction, but with a slightly bitter and acidulous taste (possibly due to slight impurity). It is soluble in alcohol, ether, chloroform, acetone, carbon bisulphide, and carbon tetrachloride, but insoluble in water. It has a pleasing but peculiar odor, differing entirely from either of its constituents and slightly recalling that of the terpenes distilled from the *Apium petroselnium* or com-

mon parsley. On heating with alcoholic solutions of KOH or NaOH, it is saponified with liberation of santalol, but is not affected by weak mineral or organic acids. Its boiling point is between 250° and 260° C. at 60 M.M.

I do not pretend to have obtained an absolutely pure santalol lactate, but the commercial process described is practical and the product all that is required for medicinal use in place of sandalwood oil.

HOTEL BREVOORT, May 5, 1911.

RAPID DETERMINATION OF SULPHURIC ACID WITH THE POROUS CLAY CRUCIBLE.

BY FREDERICK KLEIN, PH.D.

Every chemist in general will agree that up to the present our methods of gravimetric, and volumetric analysis are apt to have some phase where the accuracy is in doubt, where the reaction is not fully, or in some cases purely hypothetical, and therefore not abso-

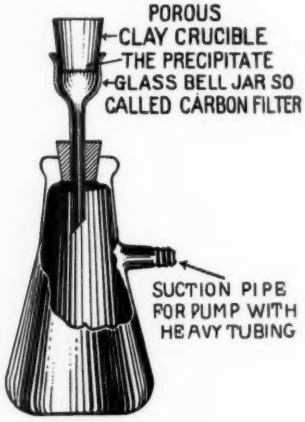
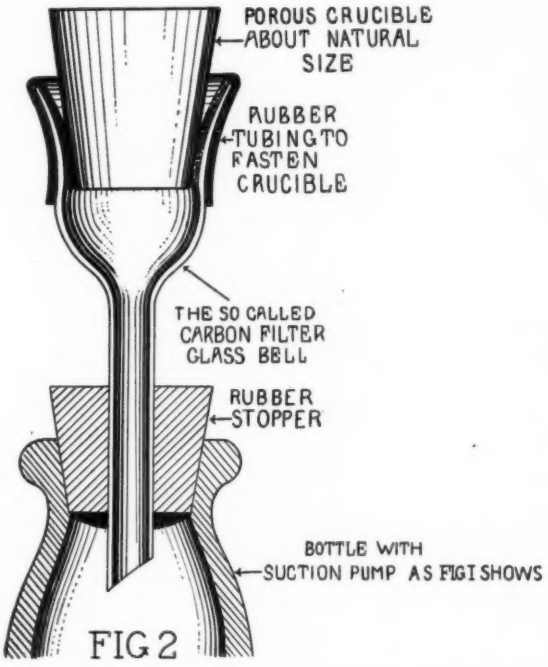


FIG I

lutely correct; we therefore go through journals and chemical literature to find our way out of a labyrinth of reactions which take place by a simple precipitation of two bodies chemically acted upon according to the laws which govern these reactions, visible and ob-

secure, to all our scientific endeavors, methods, instruments, ability and chemically reasoning.

One of the methods which is of the greatest importance and in practical use all over the chemical world is the sulphur determination by barium salts, the considerable time and ability spent to perfect this one method alone would fully prove the correctness of the statement above. In one of the latest Chemical News, the prime and most distinguished German chemical paper *Chem. Ztg.*, No. 135,


POROUS CRUCIBLE
ABOUT NATURAL SIZE
RUBBER TUBING TO FASTEN CRUCIBLE
THE SO CALLED CARBON FILTER GLASS BELL
RUBBER STOPPER
BOTTLE WITH SUCTION PUMP AS FIG I SHOWS
FIG 2

of November 12, on page 1201, we read an article: again stating that the problem of the absolute precipitation of the sulphuric acid with barium salts is still problematic and requires considerable skill and comparatively an absurd length of time to obtain concordant and satisfactory results.

I therefore with pleasure can state, that through the aid of technical progress we have succeeded and obtained a most charming chemical device in the form of a porous clay crucible manufactured by a firm in one of the New England States, and therefore an American production of the highest esteem, and importance to the chemist,

because it fully eliminates the filter paper process, which is one of the most objectionable features in most of the chemical procedures and analytical work of all kind, every chemist will welcome this porcus crucible because we all know the difficulty in burning filters, in regard to the ashes and at last, but not least, the reducing action of the carbon of the filter which is highly objectionable, especially in the sulphur determination. These and many other objections which are daily observed in regard to these methods have led me to devise

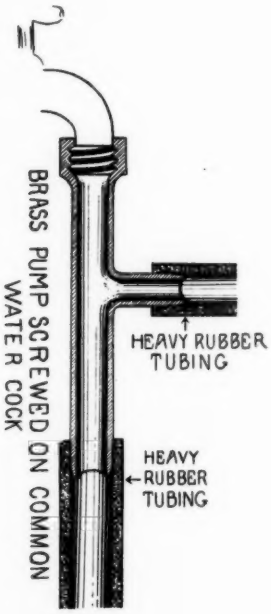


FIG 3

a new porous crucible which enables the chemist to make a dozen or even more sulphur determinations in comparatively the same length of time spent to make a single filter determination considering all points of importance in regard to boiling and addition of barium salts, etc.

Taking the advice of " Hintz " and " Weber " in their extensive study of this especial method, if we operate under the same caution and condition, there arises one and the same inaccuracy which can be tolerated in this method and by the other methods and greatly increase the accuracy after all.

I therefore describe this most simple and rapid determination of sulphuric acid, taking normal sulphuric acid as a standard with 49.05 Gm. of H_2SO_4 to the litre: 10 c.c. of $N/_1$—H_2SO_4 are transformed from a burette or pipette to a beaker of 300 or 400 c.c., the acid is then diluted with three or four times or more by volume of distilled water and boiled for a few minutes; to this solution is added a few c.c. of conc. HCl or HNO_3, stirred, and while boiling add the boiling or hot solution of barium chloride or nitrate 10 or 15 c.c. (10 per cent. solution); stir and mix, and keep mixed solution boiling for a further few minutes; then transfer to a warm place or water bath if convenient to have for settling of the macrocrystalline ppt. While the ppt. settles in water bath the porous crucible is heated and weighed which can be done very easily. I generally weigh the crucible under the same condition without the use of an exsiccator and was able to obtain very satisfactory results.

The weighed crucible is then attached to a water pump of any kind with the so-called carbon filter with rubber stopper, and a moderate stream of water will filter the hot barium sulphate ppt. absolutely clear through the porous clay crucible, leaving ppt. nearly white, and after washing with hot water, or better, slightly acidulated water to free the ppt. from barium chloride or nitrate which can be tested for such with silver nitrate or diphenylamin solution, in the filtrate. The porous crucible with ppt. is then carefully heated with a Bunsen burner and after moisture has been driven off the crucible can then be strongly heated and weighed to constancy.

I have worked out a table based on the principle of normal sulphuric acid 49.05 Gm. of H_2SO_4 to 1000 c.c. Aq. Dest. figuring the acid from barium sulphate from 9 c.c. to 11 c.c. This will enable the chemist to know exactly the strength of acid to dilute or to make stronger if necessary. Ten c.c., which averages to about 0.4905 Gm. H_2SO_4, is about or approximately the sufficient amount of any sulphate to be analyzed, with exception of sulphate ores to more conveniency in some cases to 1 Gm. and more.

This table can also be used for any sulphur analysis considering that the $BaSO_4$ as noted in the table corresponds to the product analyzed.

The crucible as such can be used for the analysis of different colloidal and semicolloidal ppts. with the same accuracy and less time. I have tried the crucible for different analyses and found it to be satisfactory.

NORMAL SULPHURIC ACID.

Factor 0.137 = for sulphur.

Interpolation table between 9 c.c. and 11 c.c.

	$BaSO_4 = 233.5$		$H_2SO_4 = 49.05 = \frac{98.1}{2}$		
cbcm of $n/_1H_2SO_4$ contains			cbcm of $n/_1H_2SO_4$ contains		H_2SO_4 in 1000 c.c.
9.0 c.c.	1.05075	$BaSO_4$	9.0 c.c. 0.44145	H_2SO_4	44.1450
9.1 "	1.062425	"	9.1 " 0.446355	"	44.6355
9.2 "	1.07410	"	9.2 " 0.451260	"	45.1260
9.3 "	1.085775	"	9.3 " 0.456165	"	45.6165
9.4 "	1.09745	"	9.4 " 0.461070	"	46.1070
9.5 "	1.109125	"	9.5 " 0.465975	"	46.5975
9.6 "	1.12080	"	9.6 " 0.47088	"	47.0880
9.7 "	1.132475	"	9.7 " 0.475785	"	47.5785
9.8 "	1.14415	"	9.8 " 0.480690	"	48.0690
9.9 "	1.155825	"	9.9 " 0.485595	"	48.5595
10.0 "	1.16749	"	10.0 " 0.49050	"	49.0500
10.1 "	1.179175	"	10.1 " 0.495405	"	49.5405
10.2 "	1.19085	"	10.2 " 0.50031	"	50.0310
10.3 "	1.2025	"	10.3 " 0.505215	"	50.5215
10.4 "	1.2142	"	10.4 " 0.51012	"	51.0120
10.5 "	1.22587	"	10.5 " 0.515025	"	51.5025
10.6 "	1.23755	"	10.6 " 0.519930	"	51.9930
10.7 "	1.24922	"	10.7 " 0.524835	"	52.4835
10.8 "	1.26090	"	10.8 " 0.529740	"	52.9740
10.9 "	1.27257	"	10.9 " 0.534645	"	53.4645
11.0 "	1.28428	"	11.0 " 0.539550	"	53.9550

$BaSO_4 \times 0.137 =$ Sulphur.

$BaSO_4 \times 0.34286 =$ Factor = Sulphur trioxide.

$BaSO_4 \times 0.420 =$ Factor = Sulphuric Acid.

To multiply factor with Barium Sulphate gives either S, SO_3 or H_2SO_4.

The following is an addition to the interpolation table:

1.	2.	3.	4.
9.0 to 9.1	9.9 to 10.0	10.0 to 10.1	10.1 to 10.2
0.051917	1.156992	1.168667	1.180342
0.053084	1.158159	1.169834	1.1815092
0.054251	1.159326	1.171001	1 182676
0.055418	1.169493	1.172168	1.183843
0.056585	1.161660	1.173335	1.185010
0.057752	1.162827	1.17450	1.186177
0.058919	1.163994	1.175669	1.187344
0.060086	1.165161	1.176836	1.188511
0.061253	1.166328	1.178003	1.189678
0.06242	1.167495	1.17917	1.190845

Example: it has been found upon using 10 c.c. of H_2SO_4 that *1.173335 $BaSO_4$* by weight, was obtained. Upon consulting table 3 this denotes that the solution of H_2SO_4 is 5/100 or 0.05 in 10 c.c. too strong.

THE ADRENALIN PATENTS VALID.

THE UNITED STATES CIRCUIT COURT SO DECIDES.

When the physiological and therapeutic value of the suprarenal gland had become fully established, several prominent chemists, believing its valuable properties to be due to an active principle, studied strenuously to isolate it. Two at least came very near success. It remained for Dr. Jokichi Takamine, however, to achieve the sought-for result, and he secured basic patents covering the substance, its salts and solutions, simultaneously publishing his methods. Other investigators afterward claimed to have isolated the active principle, and there appeared on the market, in addition to Adrenalin, similar preparations under other names.

It became a much-mooted question whether Dr. Takamine was entitled to priority, and whether the patents were valid. Parke, Davis & Co. purchased the Doctor's rights in consideration of a royalty, under agreement that payment of the royalty should cease if the patents were invalidated. To determine the question of the validity of the patents two suits were brought against the H. K. Mulford Company in 1905, involving these questions: First, Are Adrin and Adrin Solutions infringements of the patents covering Adrenalin and Adrenalin Solution, respectively? Second, If so, are these patents valid? Upward of five years was consumed in taking expert testimony respecting the history of the discovery, etc., and the hearing was not had until February 3, 1911, when the matter was submitted on argument, the records and briefs covering over a thousand closely printed pages.

Saturday, April 29th, Judge Hand, of the United States Circuit Court for the Southern District of New York, handed down an elaborate opinion answering both questions affirmatively. The effect of this opinion is that other substances similar to Adrenalin, and called by other names, are infringements of the Takamine patents.

Concluding, Judge Hand says:

"Whatever confusion the intricacy of the subject matter causes, one fact stands out which no one ought fairly to forget: Before Takamine's discovery the best experts were trying to get a practicable form of the active principle. The uses of the gland were so great that it became a part of the usual therapy in the best form which was accessible. As soon as Takamine put out his discovery, other forms practically disappeared; by that I do not mean abso-

lutely, but that the enormous proportion of use now is of Takamine's products. There has been no successful dispute as to that; hardly, indeed, any dispute at all. What use remains is, so far as the evidence shows, of the old dried glands, which every one concedes to have been dangerous, at least for intravenous use. All this ought to count greatly for the validity of the patent, and Takamine has a great start, so to speak, from such facts. . . . He has been author of a valuable invention, and has succeeded where the most expert have failed."

The litigation has been conducted in the most friendly spirit between the two great houses concerned. Parke, Davis & Co. had nothing to lose, since, had the patents been declared invalid, they would not longer have been handicapped by the payment of royalty, but could have marketed upon equal terms with competition. As it is, under their arrangement with Takamine, they are entitled to the exclusive right to manufacture and sell the active principle of the suprarenal gland, its salts and solutions, during the life of the patents, after which the Doctor's processes, as well as his products, will become *publici juris.*

CORRESPONDENCE.

AMERICAN PHARMACEUTICAL ASSOCIATION.

EDITOR AMERICAN JOURNAL OF PHARMACY:

Enclosed please find an announcement of the preliminary arrangements for the approaching meeting of the A. Ph. A.

Kindly use as much of it as you can give space for, and I will supplement this notice with more specific details as they are finally determined upon.

Our members are enthusiastic and promise great things in the way of entertainment, and we are assured that the meeting will be a most successful one.

Yours sincerely,

C. HERBERT PACKARD.

THE AMERICAN PHARMACEUTICAL ASSOCIATION AT BOSTON, AUGUST 14 TO 18, 1911.

The meeting of the American Pharmaceutical Association at Boston in August promises to be one of the most successful meetings in the history of this honorable scientific organization.

Boston is an ideal city for a summer convention and the doors of her warm-hearted hospitality are being set wide-open to welcome with the most diligent service of heart and hand, her friends of the East, the West, the Southland and the Northland, whose smiling faces and cheery welcomes have so often made the Boston pharmacists feel at home with them.

While Boston's welcome to the association will be a warm one, yet one need not think it attributable to the temperature, for Boston is never sultry; the breezes from Massachusetts Bay, which are nearly always in evidence, making the city cool when places inland are sweltering in heat.

Beyond the natural interest which the scientific pharmacist will have in the interesting and instructive meetings at which will be gathered the leaders of pharmaceutical thought of this and foreign countries, the other many and varied attractions of St. Botolph's town appeal to every one and draw them irresistibly to that city, for without the inspiring memories which throng around it, there would be no American pharmacy. Its streets were trod by Warren, by Adams, by Revere and by Hancock, and the first American blood shed for our independence flowed in its streets. Around and about the city are Lexington and Concord, Bunker Hill and Dorchester Heights; Plymouth with its historic "Rock," where the Pilgrims established the first American Commonwealth, "In the Name of God, Amen!"; Cambridge with its memories; John Harvard and his college, with its treasures of surpassing interest in its Germanic Museum and other interesting collections, its reminiscences of Longfellow and of Lowell; Salem, the Witch City and its House of Seven Gables of Hawthorne; Gloucester with its "Reef of Norman's Woe"; and Marblehead, through whose streets "Old Floyd Ireson was carried in a cart"; Amesbury and Haverhill with their memories of "The Quaker Poet," Whittier.

Around Boston is an inexhaustible mine of history and memories among which the visitors to that city may delve for weeks to their interest and profit.

The Committee on Entertainment, under the energetic lead of Mr. C. Herbert Packard, the Local Secretary, is working diligently to assure to every member in attendance a most pleasurable occasion, with the avowed purpose that all will ever remember it as an event in their lives. The co-operation of the Chamber of Commerce, an organization of 3000 leading business men of Greater Boston, has

been pledged, and its President, Mr. George S. Smith, will probably welcome the association to the city; Governor Foss and Mayor Fitzgerald have both earnestly assured the committee of their desire to extend to the members a true Boston welcome.

The headquarters of the association will be at the Hotel Vendome, one of the noted hotels of this continent, whose walls have sheltered royalties in their visits to Boston. This hotel is located on the famous Commonwealth Avenue, one of the finest residential avenues in the country; within a stone's throw of this hotel is the noble Copley Square, which is undeniably one of the finest public squares of the world, vying for pre-eminence with the Place de la Concorde in Paris.

The meetings of the Association will be so arranged as to give abundant time for sight-seeing, and the ladies who accompany the members will be taken into the assiduous care of the Ladies' Entertainment Committee, of which Mrs. Adelaide Godding, the wife of the President-elect of the association, is chairman; and it is therefore certain that not an idle or a tedious moment will be allowed to intrude its attention upon any of the fair visitors during their visit to the Hub.

The Committee on Entertainment say that the old adage, "See Naples and die," has been recently revised and now reads, "See Boston and live; enriched for all time with the memory of its treasures, and of its hearty New England welcome."

COME TO BOSTON!!!

BOOK REVIEWS.

ORGANIC CHEMISTRY FOR THE LABORATORY. By W. A. Noyes, Ph.D., Professor of Chemistry in the University of Illinois. Second Edition, Revised and Enlarged. Easton, Pa., The Chemical Publishing Company. 1911.

Professor Noyes has well stated in his preface to the first edition of his "Laboratory Manual" that "the science of organic chemistry rests, for its experimental foundation, on the preparation, usually by synthetic means, of pure compounds. Without a knowledge, based on personal experience in the laboratory, of the relations involved and the methods which may be used in such preparations, no satisfactory knowledge of the science can be acquired."

The book has been well conceived and well developed, and it will not only be found useful to the student, but also of special value to the advanced worker, as it is full of suggestions. The most important laboratory processes which have been worked out in the development of organic chemistry are considered. The directions are full and accurate, and the theoretical explanations of the processes are clear and concise.

In addition to much valuable information, as found in the chapters on the general operations, the analysis of carbon compounds, and the qualitative examination of such substances, the methods for the preparation of 131 separate compounds are given. These include hydrocarbons; alcohols and phenols; ethers; aldehydes, ketones and their derivatives; acids; derivatives of acids; hydroxy and ketonic acids; carbohydrates; halogen compounds; nitro compounds; amines; diazo, hydrazo, nitroso and other nitrogen compounds; and sulphur compounds.

While this book has been prepared especially for the organic chemist, it will be found of very great service to the manufacturing pharmacist. Indeed, the pharmacist, who spends some of his time in the laboratory will be stimulated in his work, and will be well repaid if he adds to his desk library this new edition of Noyes's "Organic Chemistry for the Laboratory."

THE FATS. By J. B. Leathes, M.A., M.B., F.R.C.S., Professor of Pathological Chemistry in the University of Toronto. Longmans, Green & Co., London, New York, Bombay and Calcutta. 1910. 4s. net.

This is the eleventh of the series of monographs on "Biochemistry" edited by Drs. Plimmer and Hopkins. These are exceedingly valuable books. Each monograph has been prepared by a specialist, and contains a complete bibliography. The contents of the present volume include: (1) the fatty acids, glycerol and the glycerides, other alcohols and their fatty acid esters, phospholipines, galactolipines and lipines; (2) the extraction of fat, and the estimation of fat in animal tissues; (3) physical properties of fats, general chemical methods used in analysis of fats, separation, identification and constituents of fats:—fatty acids, alcohols and phospholipines; (4) the physiology of fats: biochemical synthesis of fats and higher fatty acids, physiological oxidation of fats and the rôle of fats in vital phenomena.

The book is especially intended for the use of physiologists and biochemists. It contains, however, much information that the dispensing pharmacist could use to advantage. In the making of ointments, the preparation of emulsions and the manufacture of substances containing fatty constituents, he would obtain hints that would enable him better to co-operate with the physician and discern the objects he has in mind and why certain classes of fats apparently give more satisfactory results than others in given conditions.

A SYSTEMATIC HANDBOOK OF VOLUMETRIC ANALYSIS or the quantitative determination of chemical substances by measure, applied to liquids, solids, and gases. By Francis Sutton, F.I.C., F.C.S., Public Analyst for the County of Norfolk, etc. Tenth Edition, revised throughout with numerous additions by W. Lincolne Sutton, F.I.C., Public Analyst for the County of Suffolk, Norwich, Ipswich, etc., and Alfred E. Johnson, B.Sc., Lond. Philadelphia: P. Blakiston's Son & Co., 1911. $5.50 net.

It is now nearly fifty years since the first edition of Sutton's "Volumetric Analysis" was published. This year the elder Sutton celebrates his jubilee as a Fellow of the Chemical Society, and well may the members rejoice with him in recognition of his achievements and the useful work which he has done in pure and applied chemistry. Not only has Sutton's "Volumetric Analysis" been used by the pharmacist, manufacturing chemist, pathological chemist, etc., but it has also been adapted to the requirements in pure chemical research. And this may be taken to explain the secret of the success of the work. The author, having before him an ideal and being fully cognizant of the importance of research in advancing knowledge, has nevertheless utilized the results of research workers in the various fields of applied chemistry.

It is indeed an inspiration to read the author's preface in this the tenth edition and find his enthusiasm unabated and his optimism as great apparently as in 1863, when the first edition came from the press. He says: "An exceptionally long interval of seven years has elapsed since the publication of the last edition of this work, whilst it has been out of print for nearly eighteen months, a fact which is without precedent in its history. The interval has not left me a younger man, and I must confess that as the time for a new edition approached I have found myself, at the age of four-score years, less equal to the task. So large and so constant is the work now being

done in the domain of volumetric analysis, that the need of reconsideration of old methods and of selection from amongst the newer methods becomes more imperative with each succeeding edition of a book of this character. The present, moreover, being the tenth edition, I was particularly anxious that it should be distinguished by the most thorough and critical revision yet attempted, and, in the result, by the greatest possible consonance with modern practice. To this end, I placed its preparation entirely in the hands of my son and partner, W. Lincolne Sutton, who had accumulated a large amount of material in anticipation, and of Mr. Alfred E. Johnson, . . . who had rendered me valuable and acknowledged assistance in the course of preparing the ninth edition. I feel that I cannot pay too generous a tribute to the devotion of both editors to the task they undertook. . . . I must admit that the result has rather damaged my conceit as an author, for it is obvious that many possible improvements will reveal themselves under a meticulate examination in a book which has grown, as this has, by a process of accretion tempered by pruning and extended through nine editions over a period of forty years. I am sensible that much remains to be done, but am sanguine enough to be looking forward already to the next and jubilee edition, when the book will have attained its fiftieth year."

The editors have done their work exceedingly well. Much of the matter in the ninth edition has been entirely rewritten. It has been critically revised throughout, obsolete matter has been eliminated, but the general scope and original features of "Sutton" are retained. For pharmacists who do analytical work this latest edition of Sutton's "Volumetric Analysis" will be indeed welcome.

MATERIA MEDICA STEP BY STEP. By Arthur W. Nunn, F.C.S. London: J. & A. Churchill; also P. Blakiston's Son & Co., Philadelphia. 1911. $1.40 net.

This is one of those books that a reviewer does not like to criticise. It is always unpleasant in commenting on a book "to damn with faint praise." But the impression on glancing at this book is not favorable. One or two illustrations will suffice to show this: The author says: "Inulin is a kind of starch. . . . It can be distinguished from potato and other starches by the fact that when hydrolised it yields *levulose*, whereas the other starches when treated in the same way yield glucose."

Again, he says: "Cellulose is another kind of starch. It . . . may be distinguished from starch by its resisting the action of potassium chlorate and nitric acid."

But why call further attention to examples such as these? For him who uses the book it means " step by step " to failure.

NEW AND NON-OFFICIAL REMEDIES 1911. Containing descriptions of the articles which have been accepted by the Council on Pharmacy and Chemistry of the American Medical Association, prior to January 1, 1911. Chicago: Press of the American Medical Association, 535 Dearborn Avenue. 1911.

As stated by the Secretary of the Council in the preface, " The acceptance of the articles included in the book has been based in part on evidence supplied by the manufacturer or his agent, and in part on investigation made by or under the direction of the Council." Furthermore, we read: " The Council desires physicians to understand that the acceptance of an article does not necessarily mean a recommendation, but that so far as known it complies with the rules adopted by the Council."

There are some ten official rules of the Council on Pharmacy and Chemistry of the A. M. A. The nature of them is probably best understood in their object. They have been adopted " with the object of protecting the medical profession and the public against fraud, undesirable secrecy, and objectionable advertising in connection with proprietary medicinal articles." It is not too much to say that the Council on Pharmacy and Chemistry of the A. M. A. has done for the cause of medicine what the Bureau of Chemistry of the U. S. Department of Agriculture has accomplished in the interest of pure foods. The Council has the support of the medical profession in the same sense that the Bureau of Chemistry has the support of the members of that profession. The work of the Council is a most difficult and delicate one and yet a very necessary and fundamental one when we consider the almost bewildering number of compounds, many of which have absolutely no claim to merit, that are foisted on the medical profession each year. Some such course as this seems imperative if the profession in general would free itself from the stigma of quackery. To the younger practitioners the work of the Council should be especially helpful. Retail pharmacists generally must also appreciate the value of it and should procure copies of " New and Non-official Remedies, 1911," which

may be obtained at a merely nominal charge by addressing the Secretary, Prof. W. A. Puckner, 535 Dearborn Avenue, Chicago, Ill.

DIGEST OF COMMENTS on the Pharmacopœia of the United States of America and the National Formulary for the Calendar Year ending December 31, 1908. By Murray Galt Motter and Martin I. Wilbert. Washington: Government Printing Office. 1911.

Only the student who has experienced the grind of looking up the literature in connection with his investigations can appreciate to the fullest extent the value of the "Digest of Comments." Up to within recent years, since the appearance of the first number of "Digest of Comments," the reviewer spent much time noting articles and conserving clippings of subjects he wished to keep informed concerning. This is all unnecessary now with articles pertaining to the Pharmacopœia and National Formulary. It is very simple to take down the volumes of the "Digest of Comments" and quickly turn to the subject of the article one is working upon. There will be found, with abstract, references to all of the published papers on the subject during any one year. Not only this, but the foreign Pharmacopœias are reviewed and valuable tables are given showing the relationship of the preparations in the different pharmacopœias.

OBITUARY.

CALEB R. KEENEY.

In the death of Caleb R. Keeney, the retail drug trade has lost one of the best types of the profession. Mr. Keeney was born in Carlise, educated there, and apprenticed to the 1st Henry Blair, who had his store where the 3d Henry C. Blair is now at Eighth and Walnut Streets, Philadelphia.

Mr. Keeney at the termination of his apprenticeship commenced business for himself at Sixteenth and Arch Streets, and continued there until the day of his death; his son having been associated with him for thirty-five years and succeeds to the business.

There are not many drug pharmacists in Philadelphia to-day who have remained so close to the calling. He was what Prof. Parrish said a druggist was in his neighborhood: An "Oracle" as it were. The Professor in speaking of the druggist said that he

was supposed to know everybody of any account in his section, and that the public found this generally to be true. I am sure that even to-day if one wishes to ascertain the residence of a person his first inquiry would be at the nearest drug store. Mr. Keeney saw many changes in his immediate section; the old families vanished and new people came into the neighborhood. Other stores at times came into existence near him, but nothing could impair the confidence reposed in him and his store by his neighbors and the medical profession. There is not a store in Philadelphia to-day where legitimate pharmacy is more in evidence than in the old store of Mr. Keeney. Living for a time near him and frequently dropping in I do not remember seeing a proprietary or many of those other rather inconsistent items that most stores display.

Mr. Keeney graduated from our College in the class of 1846 and was at the time of his death the oldest living graduate. In the same class was the late Thomas S. Wiegand. He was a member of the College and for many years of the American Pharmaceutical Association. Of quiet tastes he won the esteem of all who were brought into contact with him, and it is gratifying to know that the pharmacy will no doubt be carried on in the same lines by his son, who has been with him for 35 years. He died February 1, 1911, in his eighty-sixth year, after a short illness. He leaves a son

E. T. Ellis.

PHARMACEUTICAL MEETINGS.

March meeeting.—The sixth of the pharmaceutical meetings was held on March 15, with W. L. Cliffe in the chair. At this meeting, two papers were read, treating of the subject of petrox preparations. The first of these papers was by Mr. Geo. M. Beringer, Ph.M., and George M. Beringer, Jr., P.D. This paper is the result of a rather extensive series of experiments which have been carried out by the authors in order to recommend the most satisfactory formulæ for the petrox preparations of the National Formulary. A large number of preparations were shown and the entire paper is published in the May issue of this Journal.

The paper by Mr. Raubenheimer is also published in this issue and was in the nature of a supplementary work to that of the pre-

ceding paper, in fact the results obtained by Mr. Beringer and his son were confirmed by Mr. Raubenheimer (see p. 223).

APRIL MEETING.—The seventh of the pharmaceutical meetings was held on Tuesday, April 18th, with Dr. C. A. Weidemann in the chair. Professor C. B. Lowe gave an interesting talk upon "Pharmaceutical Economics." He exhibited a number of pieces of apparatus illustrating the making of emulsions, tablet triturates, filling of capsules, gelatin coating of pills, etc. He also called attention to a method which is sometimes useful in preventing the directions upon prescription bottles from becoming indistinguishable by reason of the liquid flowing on the outside when used by the patient. The directions are pasted next to the bottle and can readily be seen looking through the bottle from the opposite side. This is particularly useful in preserving the number of the prescription and the copy of the same. The number being helpful to the pharmacist and the copy useful to the physician.

Professor Kraemer exhibited the collection of drugs of the Japanese Pharmacopœia which he had received from one of the Honorary members of the College, Dr. W. N. Nagai of the University of Tokyo. The specimens were in large glass stoppered bottles, made a splendid exhibit and included the following: Amylum Erythroni (Katakuri), obtained from *Erythronium. dens-canis* L.; Amylum Puerariæ (Kazu) obtained from *Pueraria Thunbergiana* Benth.; Radix Coptidis (Orea) Tamba, obtained from *Coptis anemonæfolia* S .et Z.; Radix Coptidis (Oren) Kaga, obtained from *Coptis Art;* Radix Gentianæ Scabræ (Riutan), obtained from *Gentiana scabra* Bge. *var. Buergeri* Maxim.; Radix Phytolaccæ (Shoriku) obtained from *Phytolacca acinosa* Roxb. *var. esculenta* Maxim.; Semen Pruni Armeniacæ (Kiyonim) obtained from *Prunus Armeniaca* L.; Folia Pruni Macrophyllæ (Bakuchi yo) obtained from *Prunus macrophylla* S. et Z.; and Radix Taraxaci cum Herba (Hokoye) obtained from *Taraxacum officinale* Wigg. *var glaucescens* Kock.

MAY MEETING.—The last of the series of meetings for 1910 and 1911 was held on May 16th, Mr. Henry C. Blair presiding. The meeting was given over to the members of the graduating class for the presentation and discussion of their theses. The following gave abstracts of the same: Morris Haimowitz, Samuel Millrood, Julius G. Rappaport, W. W. Rose and Frank X. Hedges. Abstracts of some of these theses will be published in later issues of this JOURNAL.

Notes and News.

Prof. Oscar Oldberg received the honorary degree of Doctor of Laws at the commencement exercises of Northwestern University on June 14, 1911.

Samuel W. Fairchild, former president of the College of Pharmacy of the City of New York was awarded the honorary degree of Master of Science at the commencement exercises of Columbia University on June 27, 1911.

Prof. J. W. Sturmer of Purdue University was awarded the degree of Doctor in Pharmacy at the commencement exercises of Buffalo College of Pharmacy on June 1st, 1911.

Dr. Julian W. Baird, Dean of the Massachusetts College of Pharmacy, died on June 26, 1911. Funeral services were held at the college building on June 28, 1911.

Prof. Harry Vin Arny, Dean of the Cleveland School of Pharmacy, has been appointed to the chair of Chemistry in the College of Pharmacy of the City of New York, succeeding Prof. Virgil Coblentz, who resigned to take charge of the analytical department of E. R. Squibb & Sons.

Dr. E. F. Kelley, superintendent of the laboratories of Messrs. Sharp and Dohme, has become director of the Pharmaceutical Laboratory of the School of Pharmacy, University of Maryland.

Prof. John Attfield, the eminent English chemist and one of the leading authorities in pharmaceutical chemistry, died on March 20, 1911. A very complete biographical sketch of Professor Attfield, written by F. A. Upsher Smith, was published in the March issue of this Journal for 1906. An excellent portrait of Professor Attfield also accompanies this article.

Professor Attfield was "a man of many interests, and whatever his hand found him to do he did that with all his might. And he did many things. He was one of the founders of the British Pharmaceutical Conference, for many years Editor of its Transactions, for 17 years its senior Secretary, and on two occasions its President. His connection with the British Pharmacopœia began in 1882 and ceased on the publication of the 1898 edition and the issue in 1900 of the Indian and Colonial Addendum."

His body was cremated at Golder's Green and in addition to the members of the family who attended the services, were a number of representatives of societies with which Professor Attfield had a prominent connection.

From photograph made by Underwood and Underwood, New York.

HARVEY WASHINGTON WILEY